

DESCRIPTION

5 [001] The present invention relates to an electric device comprising a plurality of operating elements which can be operated by a user, each having an associated status display device, and comprising a control logic unit which is coupled to the operating elements to detect user operations and is set up to adjust an operating state of the refrigerating appliance according to the user operations.

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[002] Complex versatile control logic units based on micro-processors or micro-controllers allow electrical appliances to be equipped with a plurality of functions which aim to enhance the operating comfort of the appliance but which as a result of their diversity, are perceived by many users more as confusing than as facilitating handling.

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[003] If each possible function is allocated its own button, this rapidly results in a complex diversity of buttons on the appliance so that a user must first search for the corresponding button to activate a desired function. This is not very convenient and is also expensive because of the large number of buttons.

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[004] The alternative is to allow the selection of a desired function by successive actuation of several buttons. The number of buttons required is thereby reduced but this can easily become confusing for a user since not every combination of button actuations results in a meaningful result and there can be intermediate states in which the control logic unit expects the actuation of certain buttons to be able to adjust a function and possibly ignores other button actuations.

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[005] In electrical appliances it is also usual to use operating elements with an allocated status display. In the simplest case, this can be a mains switch with a built-in light, for example, which is switched on when the appliance is operating and which is switched off when it is not
30 operating or conversely. Such a status display makes it easy for a user to identify an adjusted operating state on an electrical appliance but in no way simplifies the adjustment of a desired operating state.

[006] It is the object of the present invention to provide an electrical appliance of the type described above which can have a plurality of operating states and actively facilitates the selection of an operating state for a user and allows operating errors to be avoided.

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[007] The object is solved by an electrical appliance having the features of claim 1.

[008] Whereas in the case of an operating element with a status display device, the status display device is usually used to display the status "actuated" or "not actuated" of the operating element, the present invention uses such a status display device to display to the user the status "actuatable" or "non-actuatable" of the relevant operating element under the control of the control logic unit, i.e., in order to indicate whether the electric device is in a state in which it can respond to the actuation of a certain operating element or not. Thus, when selecting an operating element to be actuated, the user can restrict themselves to those which can actually be actuated and thus easily complete an adjustment process which requires the successive actuation of a plurality of operating elements.

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[009] The status display device preferably comprises a light source for illuminating the allocated operating element.

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[010] It is appropriate if the operating elements are arranged behind a closed surface of the housing of the electric device. Firstly, this makes the electric device easy to clean without the risk of the operating elements being impaired. Secondly, the closed surface allows an operating element in the second state to recede visually strongly compared with an operating element in the first state or to make it more or less invisible. For this purpose, in the case of a luminous status display device, the illuminated state should more appropriately be the first state of each status display device.

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[011] In order to be inconspicuous, a non-illuminated operating element should have the colour of the surface of the housing surrounding it.

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[012] In order to save energy in the case of a luminous status display device, the control logic unit is furthermore more appropriately set up to switch over all illuminated status displays into the non-illuminated state with a pre-determined delay after detecting the last actuation of an operating element.

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[013] This switchover should more appropriately be made undoable if the actuation of an arbitrary operating element is detected.

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[014] Particularly considered as operating elements are capacitive proximity sensors which are able to detect if a person touches an area of the surface of the housing allocated to respectively one operating element.

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[015] If the electric device has an interior chamber which can be closed by a door, especially if the opening and closing of the door pertains to the intended use of the appliance, as is the case for example in a baking oven, a dishwasher, a washing machine, a laundry drier, a freezer or a refrigerator, it is also appropriate that the switchover into the non-illuminated state is made undoable when the opening of the door is detected. Thus, the operating elements which can be actuated are always displayed to a user who opens the door.

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[016] The electric device can also be fitted with an acoustic signal transmitter which delivers an audible signal when a handling of the operating element has been detected. This is particularly appropriate in the case of operating elements which are moved only slightly or not at all during operation, such as the afore-mentioned capacitive proximity sensors for example and wherein a user thus cannot immediately detect whether a handling of the operating element has been perceived by the device.

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[017] The operating elements are preferably combined with an alphanumeric device in an assembly. This display can indicate information supporting the operation of the device, optionally adapted to a current operating state of the device in the same way as the state of the individual status display devices and/or measured values of operating parameters of the electric device. Any illumination of the alphanumeric display can be switched on and off

depending on a detected handling of an operating element or optionally a movement of the door in the same way as the status display devices of the operating elements.

[018] Further features and advantages of the invention are obtained from the following description of an exemplary embodiment with reference to the appended figures. In the figures:

[019] Fig. 1 is a perspective view of a detail of a refrigerating appliance according to the invention; and

[020] Fig. 2 is a section from a control panel of the refrigerating appliance from Fig. 1.

[021] Figure 1 shows a section of the housing of a refrigerator in table design which is considered here as an example for an electric device according to the invention. The housing of the refrigerator is substantially constructed of a body 1, a door 2 pivotally attached to the body 1, which together with the body 1 encloses a heat-insulated interior chamber, and a cover plate 3 which closes the housing at the top. The cover plate 3 is hollow inside and the cavity is closed by a control panel 4 towards the front. The control panel 4 is an elongated flat strip of transparent plastic whose back is coated with a dark colour over most of its surface so that it is impermeable to light.

[022] Figure 2 shows a section of the control panel 4. Located behind a large-area window 5 in which the dark coloured layer is omitted, is an LCD display and behind the LCD display, approximately parallel to the control panel 4, is a luminescent screen. Light sources 6 for irradiating the luminescent screen and making the LCD display visible are located at one edge of the luminescent screen, covered by the dark colour of the control panel at the front and thus shown as a dashed outline in the figure.

[023] Located on both sides of the window 5 are a plurality of operating elements or buttons 7 on the control panel 4. The buttons 7 are each defined by a frame-shaped recess 8 in the dark-coloured layer used as backing for the control panel 4. A lettering 9 which describes the function of the buttons 7 is formed in a suitable fashion by recessing the letter in the dark

coloured layer. Each button 7 has a capacitive proximity sensor 10 attached to the back of the control panel 4 and concealed by the coloured layer, shown as a dashed outline in the figure, which serves to detect any contact of the corresponding button 7 by a user.

5 [024] The luminescent screen extends as far as behind the buttons 7 and located adjacent to these are light sources 6 concealed from direct view by the coloured layer, in order to irradiate the luminescent screen behind the buttons 7 and thus illuminate their frame 8 and lettering 9 in each case.

10 [025] The proximity sensors 10 are connected to a control logic unit (not shown) concealed behind the control panel 4, which controls the operation of the refrigerating appliance and the LCD display and the light sources 6.

[026] Also connected to the control logic unit is a door opening switch with the aid of which
15 the control logic unit controls an interior lighting of the refrigerating appliance in a manner known per se according to the state, open or closed, of the door 2.

[027] An alarm signal generator 11 is integrated in the control panel 4 in a row with the buttons 7. Like the buttons 7, it has a frame 8 and lettering 9 which are recessed in the
20 coloured layer and have a light source 6' whose colour preferably red is different to that of the light sources 6.

[028] In a combination refrigerating appliance comprising a normal refrigerating compartment and a freezing compartment, for each compartment there can be provided, for example, an
25 on/off button 7₁, 7₂ for switching on or switching off the refrigeration of the relevant compartment, a button 7₃, 7₄ for activating a high-power refrigerating mode, an increment button 7₅, 7₆ and a decrement button 7₇, 7₈. Also provided is a menu button 7₉ and an O.K. button 7₁₀.

30 [029] In a rest state all light source 6, 6' are switched off. The luminescent screen is dark and the recessed areas 8, 9 of the cover layer barely differ in their shade and brightness visible for

a user from the dark coloured layer itself. In this state, the buttons 7 are barely identifiable for a user.

[030] When the door opening switch registers an opening of the door or any one of the proximity sensors 10 registers a contact, the control logic unit goes from the rest state into a readiness state by switching on the light sources 6 at the window 5 so that the LCD display can be read off, indicating the measured temperatures in the refrigerating compartments. In addition, the control logic unit switches on the light sources 6 of all the buttons except for the O.K. button 7₁₀. If the increment or decrement button of the normal refrigerating compartment or the freezing compartment is touched, the control logic unit responds by displaying a text line "adjust freezing compartment temperature" or "adjust refrigerating compartment temperature" and indicating an ordered list of adjustable temperatures among which that currently set is emphasised, in the LCD display and the O.K. button 7₁₀ is illuminated. The control logic unit reacts to any further contact of the increment or decrement buttons allocated to the selected refrigerating compartment by raising or lowering the desired temperature for the relevant compartment by a single stage and indicating the value now selected on the LCD display. By touching the O.K. button 7₁₀ the user can end the adjustment process, the control logic unit takes over the emphasised indicated value as the new desired value of the temperature for the relevant compartment and returns to the previous readiness state.

[031] If the user now touches the on/off button 7₁, 7₂ or the fast-freeze mode button 7₃, 7₄, the relevant command is directly processed by the control logic unit and the state, illuminated or non-illuminated, of the individual buttons does not change.

[032] If the user touches the menu button 7₉, the control logic unit displays a name of the first menu item on the LCD display, switches on the illumination of the increment and decrement buttons 7₅, 7₆ or 7₇, 7₈ and the O.K. button 7₁₀ and switches off that of all the other buttons. By touching the increment or decrement buttons, the user can scroll forwards and backwards through a list of menu items and display the description of a respectively selected menu item in the LCD display.

[033] A menu item for example comprises storage instruction. If this menu item is selected, a list of the letters of the alphabet appears first on the LCD display and the user can select a letter using the increment and decrement button and confirm with the O.K. button 7₁₀.

Thereupon, the control logic unit displays a designation of a foodstuff beginning with the selected letter and information on its recommended storage time in the freezing compartment on the LCD display; other foodstuffs beginning with the same letter can be selected in turn using the increment and decrement buttons. By again pressing the menu button 7₉, the menu item "storage instructions" is left and the selection state in which the user can select a further menu item is restored.

[034] A further menu item can be the display of the room temperature if the refrigerating appliance is fitted with a sensor for this. The detected temperature is simultaneously displayed with the designation of the menu item; the increment and decrement buttons for scrolling further in the list of menu items and the menu button 7₉ for ending the menu selection mode are illuminated.

[035] A third possible menu item is the adjustment of the brightness of the light sources 6. If this menu item is selected by touching the O.K. button, increment and decrement buttons 7₅, 7₆ or 7₇, 7₈ for varying the brightness of the light sources 6, the O.K. button 7₁₀ for ending the brightness adjusting mode by taking over any change and the menu button 7₉ for ending the adjustment mode by rejecting any change are illuminated and can be actuated.

[036] A fourth menu item for adjusting the loudness of an alarm tone with which the refrigerating appliance draws attention to a fault state in addition to the visual display by the signal transmitter 11 functions in a similar manner.

[037] A fifth possible menu item is the display of a service call number; as in the case of the room temperature, this call number appears directly with the designation of the menu item in the display and merely increment and decrement buttons for scrolling further in the menu and menu button 7₉ for ending the menu selection mode are illuminated and can be actuated.

[038] The language of the text messages appearing in the display is considered as the sixth menu item. If this menu item is confirmed by touching the O.K. button 7₁₀, the user can successively display supported languages using increment and decrement buttons and can select one of these by touching the O.K. button 7₁₀, or leave the selection mode without
5 making any change by touching menu button 7₉.

[039] Any touching of a button 7 or opening the door 2 starts an internal timer of the control logic unit which switches off all the light sources 6 and set the control logic unit back to its rest state after a predetermined time interval has elapsed. If a new opening of the door or
10 touch of a button is registered before the time interval predetermined by the time has elapsed, the timer is reset so that the predetermined time interval in each case begins to run anew from this last detection time.